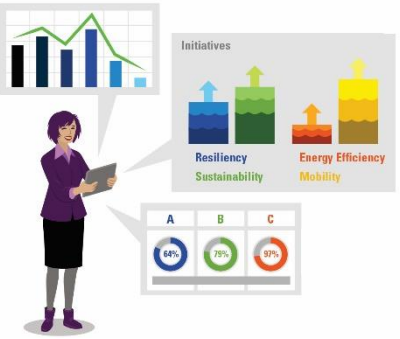
Bentley Digital Cities

A Comprehensive Portfolio for Reality Modeling and Mapping Workflows

Digital Twin

Model, analyze and simulate to improve performance & predict outcomes

- Planning and visualization
- Stakeholder engagement
- Infrastructure resilience



Create and visualize digital twin at city-scale

Support smart city initiatives with digital city operations

Digital Twin:

- Bridges the physical and virtual
- Spans entire asset lifecycle
- Is updated continuously
- Is a way to visualize assets, check status, perform analysis and generate insights

Bentley
Advancing Infrastructure

Starts with 4D CONTEXT

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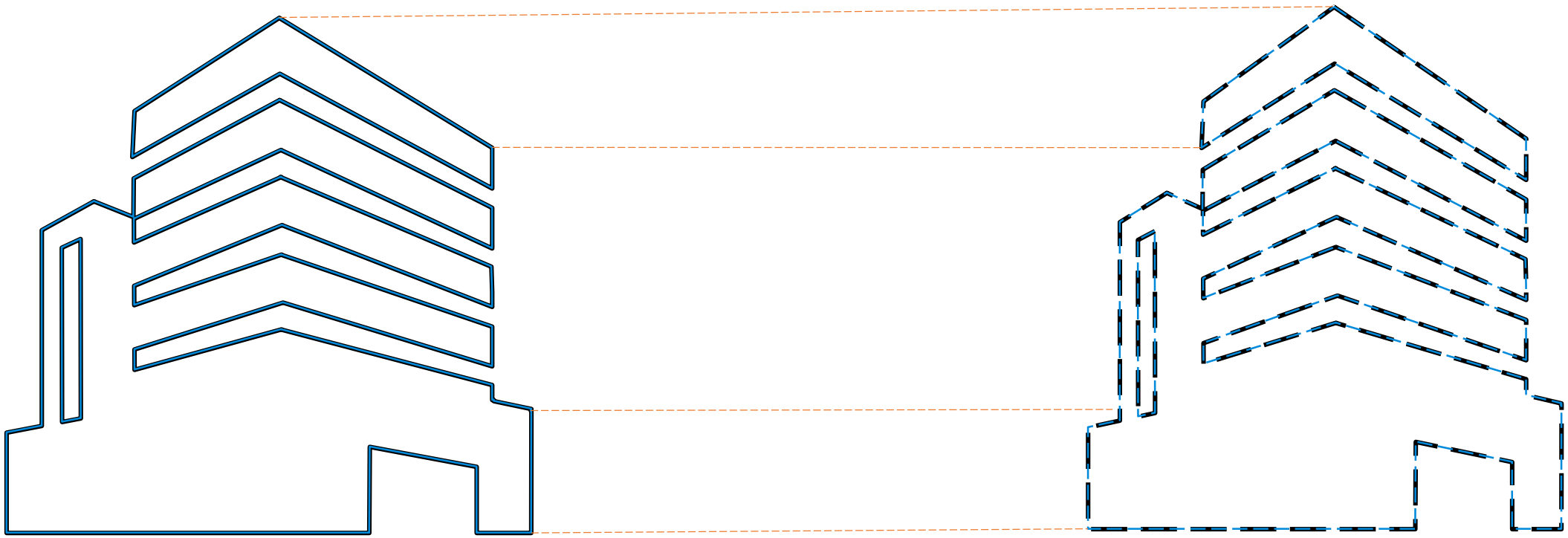

Connecting Reality and Virtuality.. **with 4D Context**

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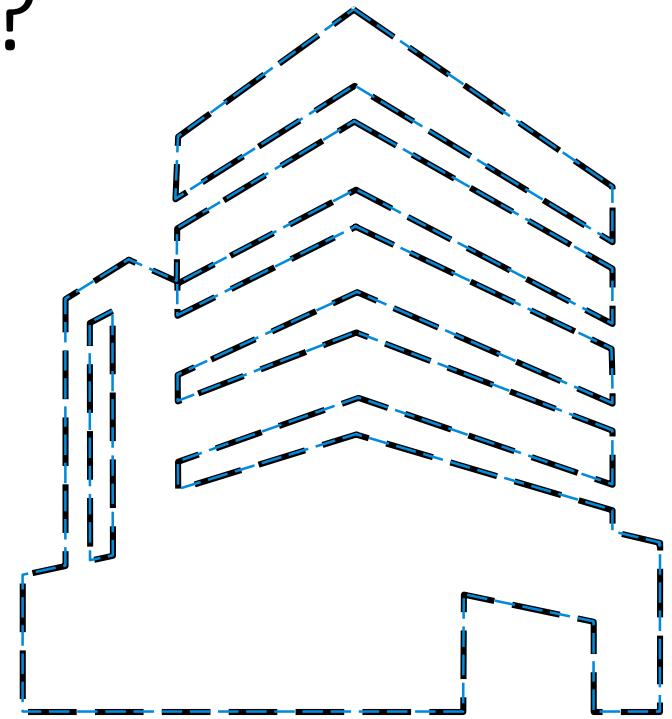
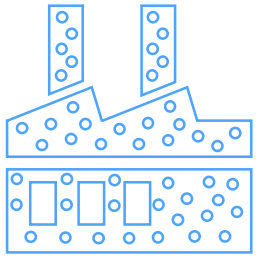
Advancing Infrastructure

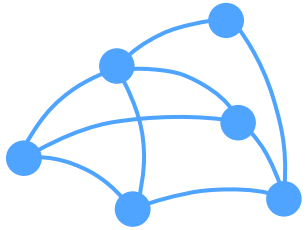
What is 4D Context?



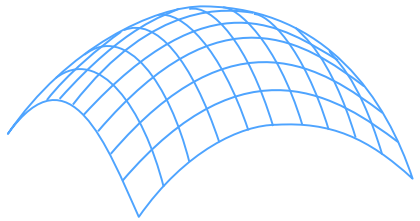
Photos



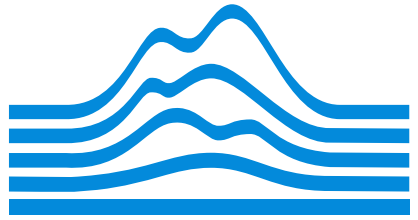
Point Cloud



Reality Mesh



Terrain



2D & 3D Maps

Reality Modeling and OpenCities Missions

Continous Survey

Creating, Updating and delivering Digital Context

4D Context

Leveraging Digital Context in Infrastructure workflows

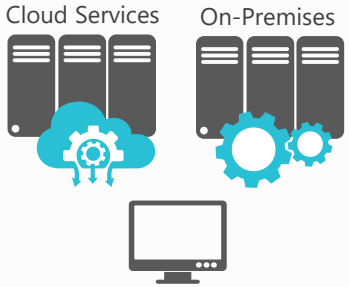
Reality Modeling and Mapping Experts

Digital Twin Users

Bentley

Reality Modeling, Survey and Mapping Experts

CAPTURE



AUTOMATIC PROCESSING, MANUAL PROCESSING & EDITING

Digital Twin Users

CONSUME Reality Data

CONSUME BIM Data

4D Reality Context Management

- 4D Reality Data (snapshot) (Point Clouds; Images, Ortho, Meshes..
- 3D GIS & Maps
- Survey deliverables

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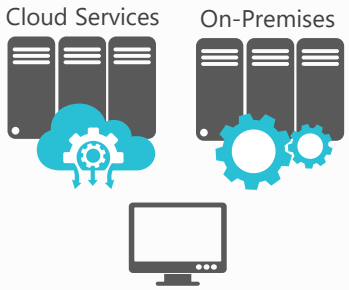
Optimization: speed, quality and cost

optimization = reach of the data

Reality Modeling, Survey and Mapping Experts

CAPTURE



AUTOMATIC PROCESSING, MANUAL PROCESSING & EDITING

Digital Twin Users

CONSUME Reality Data

CONSUME BIM Data

4D Reality Context Management

- 4D Reality Data (snapshot) (Point Clouds; Images, Ortho, Meshes..
- 3D GIS & Maps
- Survey deliverables

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Supporting 4D *Reality Meshes,* Creation & Update with **ContextCapture & PW ContextShare**

- ContextCapture (Desktop or Center) & ContextCapture Cloud Service turn photos & point clouds into Meshes
- PW ContextShare enables secured storage of Reality Data & collaboration between RM specialists.

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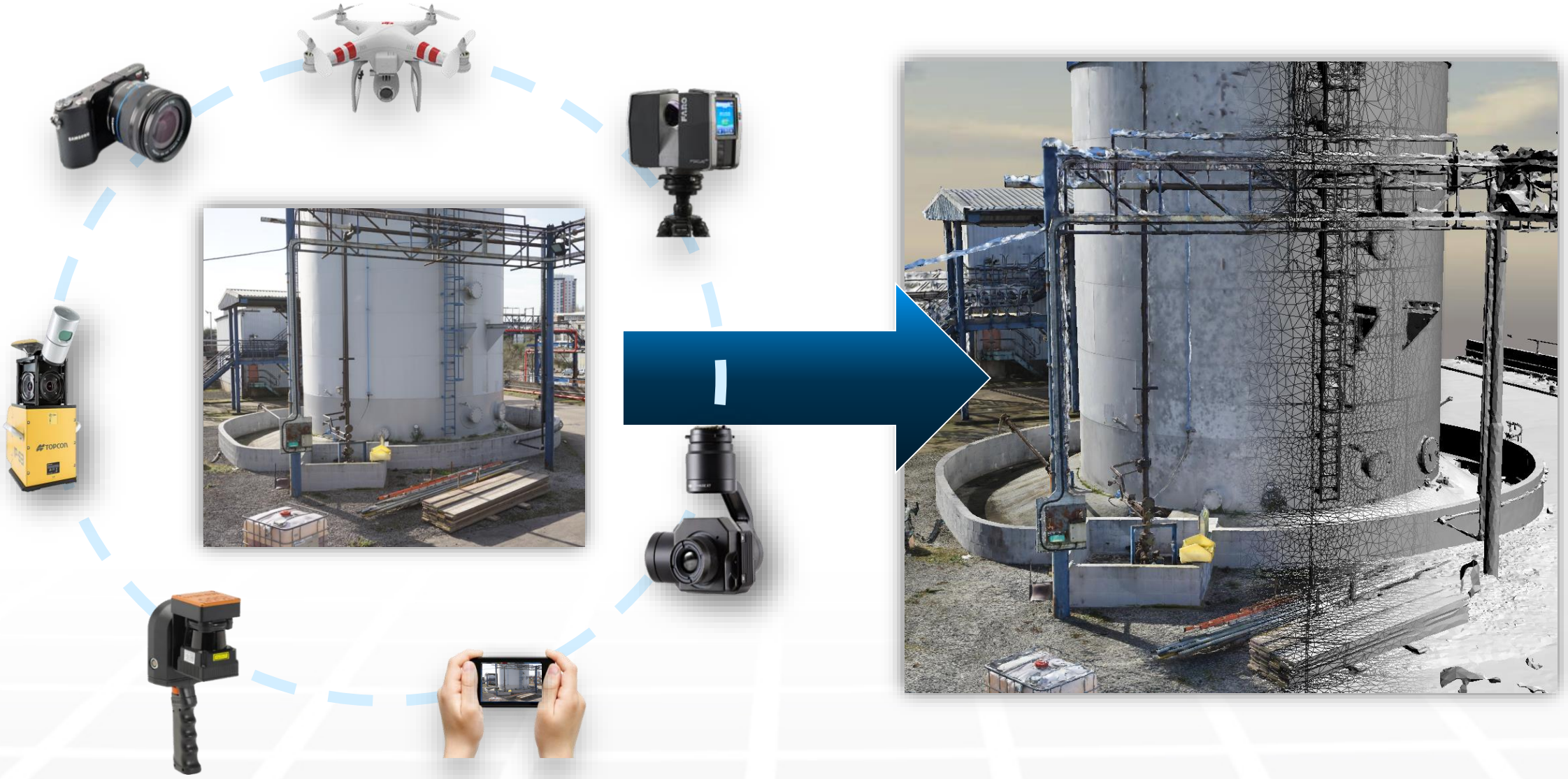
ContextCapture and ContextCapture Cloud



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Acquire pictures or laser scans

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Generate high-fidelity 3D reality meshes

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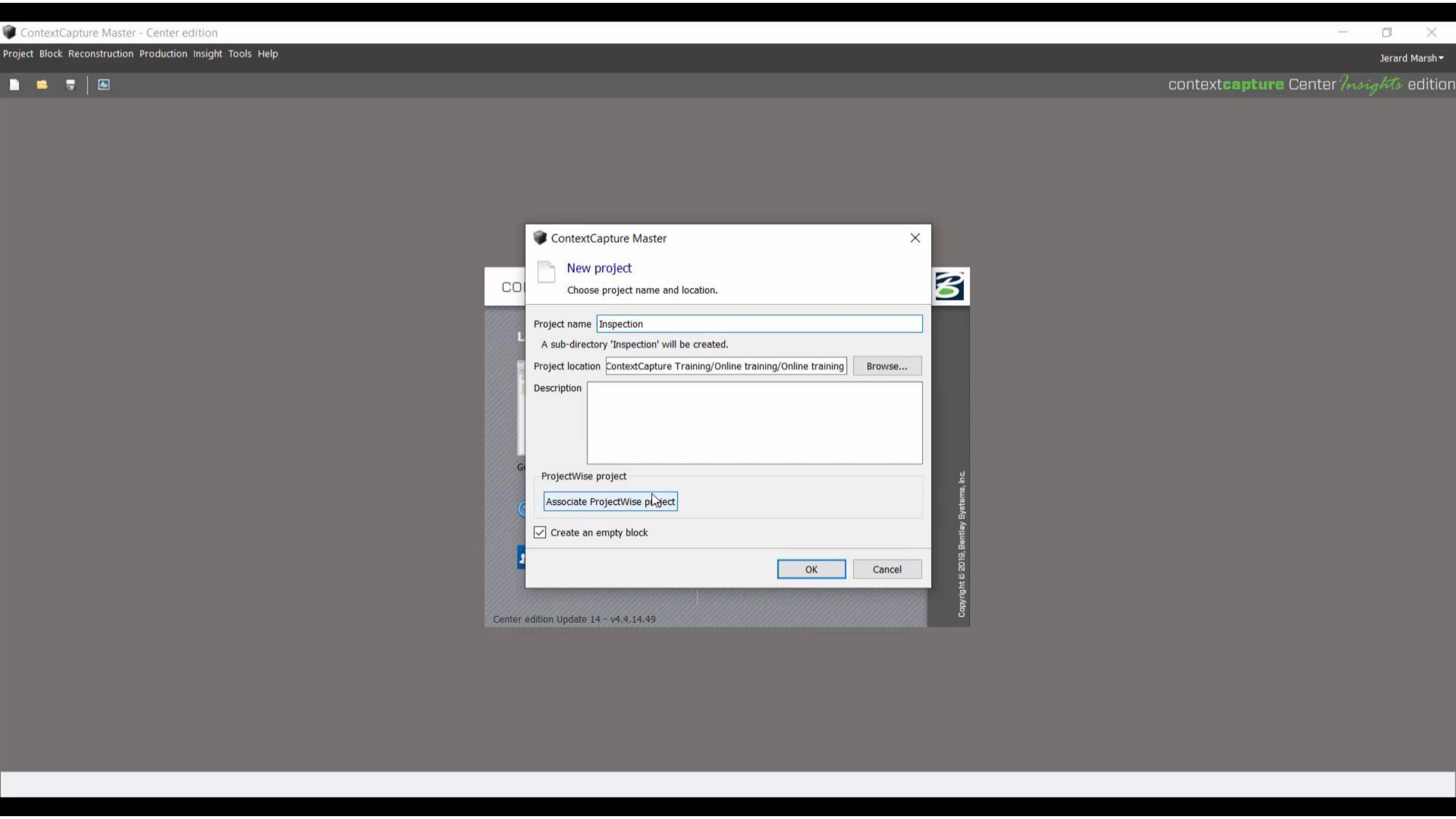
ContextCapture Master - Center edition
Project Block Reconstruction Production Insight Tools Help
Jerard Marsh
contextcapture Center Insights edition
ContextCapture Master
New project
Choose project name and location.
Project name Inspection
A sub-directory 'Inspection' will be created.
Project location ContextCapture Training/Online training/Online training
Browse...
Description
ProjectWise project
Associate ProjectWise project
Create an empty block
OK
Cancel
Center edition Update 14 - v4.4.14.49
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Review reality mesh in the Reality Data Web Viewer

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[ContextCapture] Processing of "Inspection - cloud - Version 1" has completed! - Message (HTML)

File Message Help ProjectWise Tell me what you want to do

Ignore Junk Delete Archive | Reply Reply All Forward Meeting IM More | Move to: ? Team Email Reply & Delete To Manager Done Create New | Move Rules OneNote Actions | Assign Policy Mark Unread Categorize Follow Up | Translate Find Related Select | Read Aloud | Zoom | Report Phish to SOC | Insights

Delete Respond Quick Steps Move Tags Editing Speech Zoom Bentley SOC

Fri 04/10/2019 11:20

CC

ContextCapture cloud processing service <no-reply@bentley.com>

[ContextCapture] Processing of "Inspection - cloud - Version 1" has completed!

To Jerard Marsh

If there are problems with how this message is displayed, click here to view it in a web browser.
Click here to download pictures. To help protect your privacy, Outlook prevented automatic download of some pictures in this message.

Bentley

ContextCapture cloud processing service

Processing of **"Inspection - cloud - Version 1"** has **completed**.

Open model in Reality Data Web Viewer

Access the ProjectWise Project.

Processing Report

Inputs:

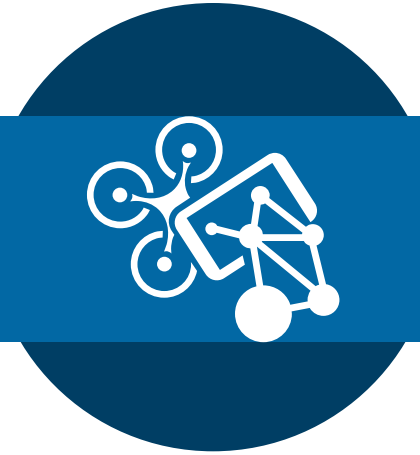
Photos: **310 (6.1882 gigapixels)**

Settings:

Quality: **Extra**

Speed Factor: **Maximum**

ContextCapture Insights



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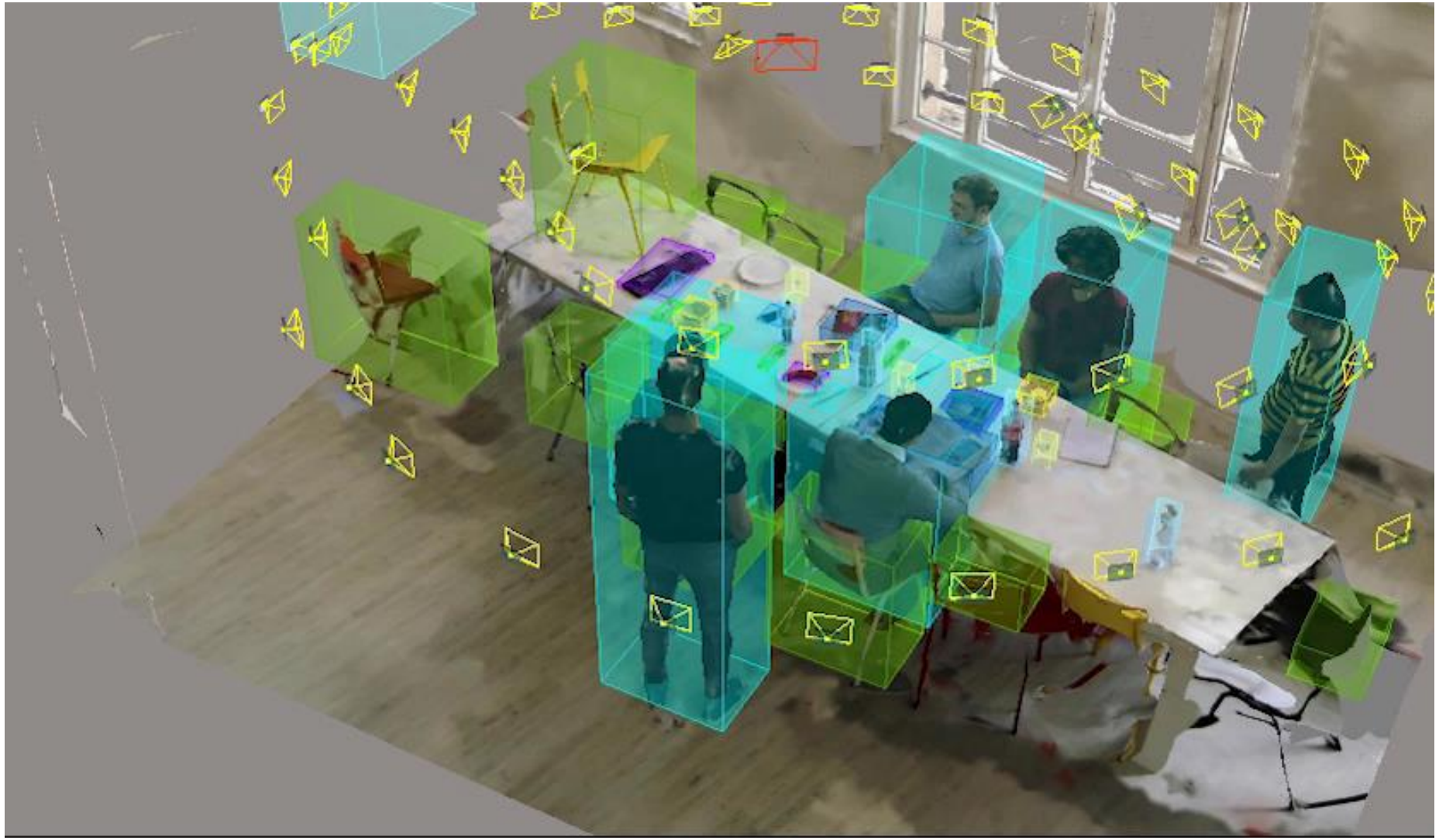
Detecting 3D objects from a georeferenced collection of images



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Searching a collection of images for given objects

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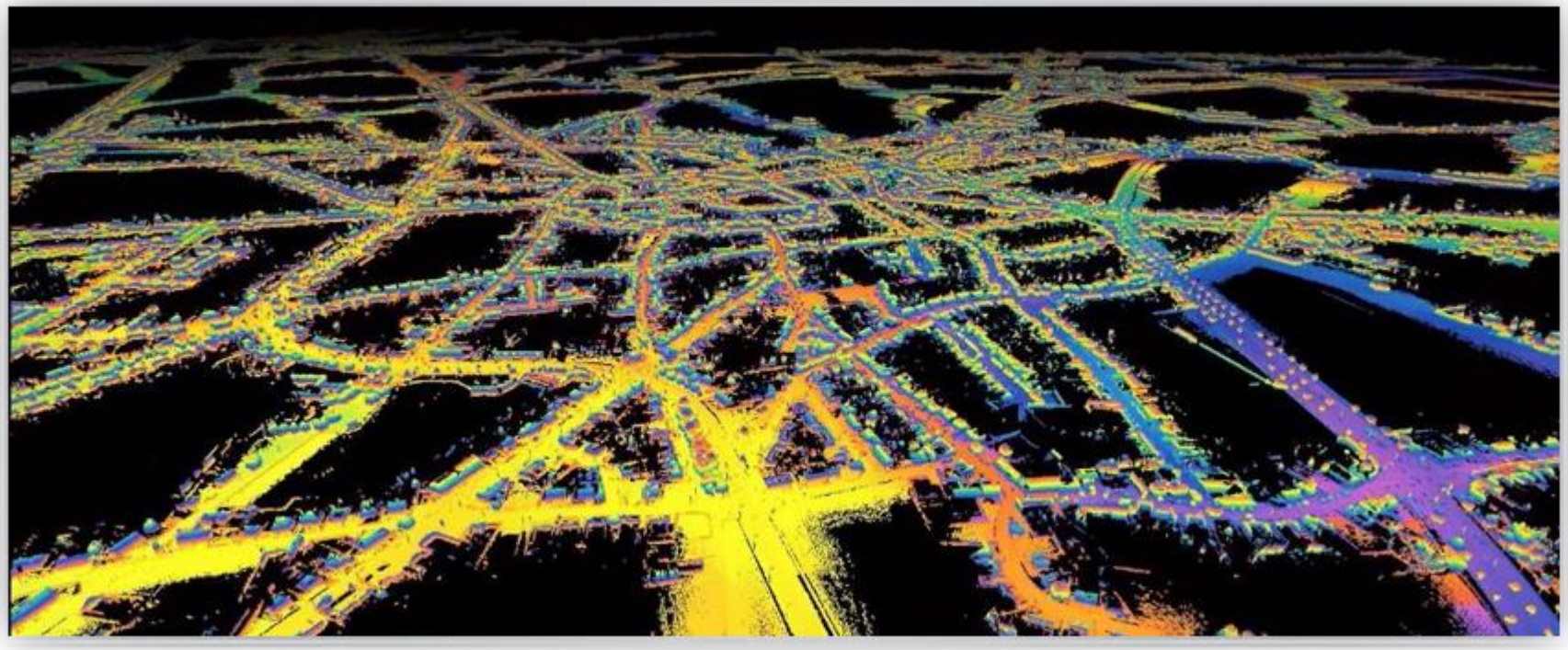
Supporting 4D *Mobile Mapping Data* Creation & Update with **3DM Context Manager**

orbit



- 3DM Context Manager enables effective import, structuring, consolidating, cataloging of Mobile Mapping Data

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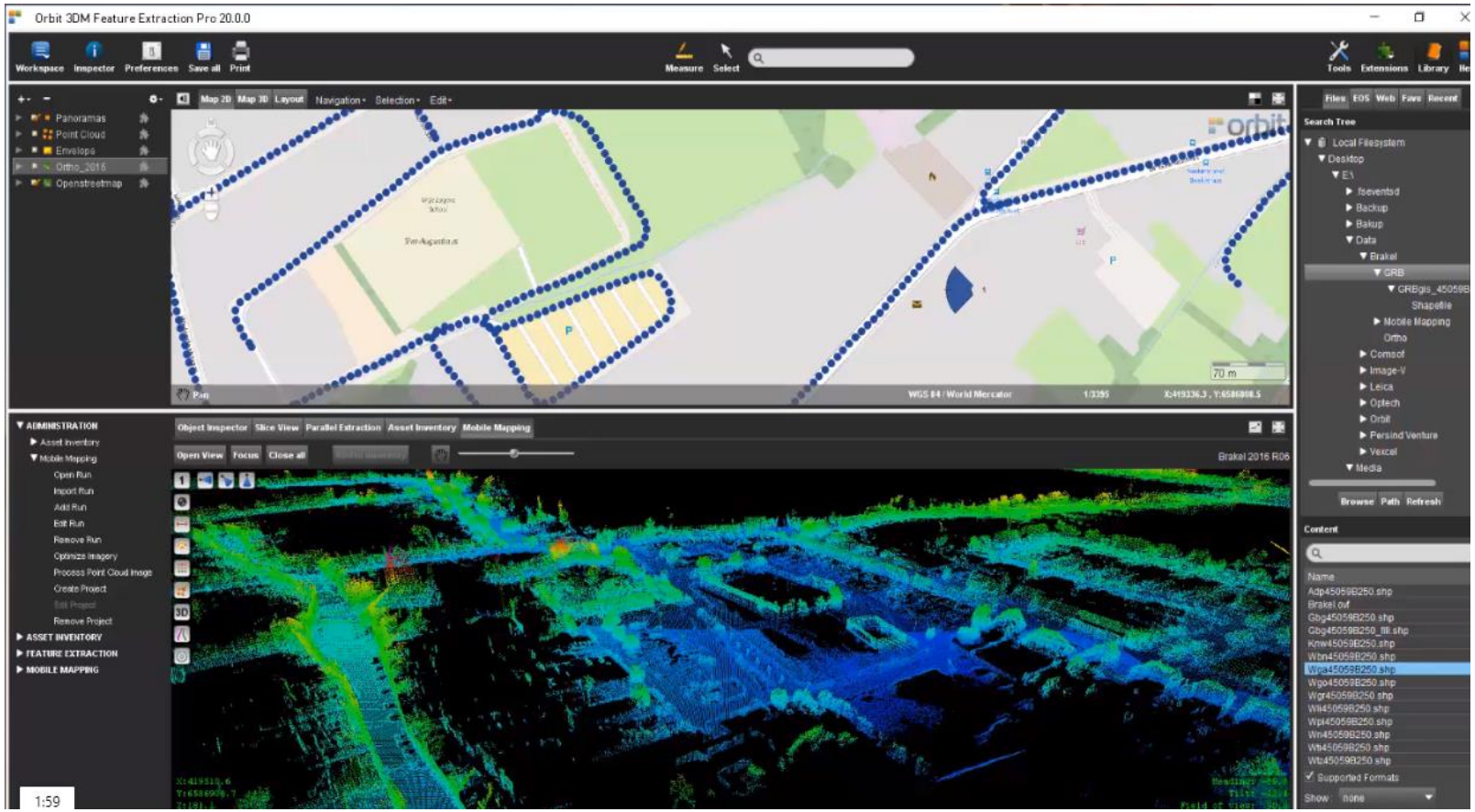
Supporting 4D *Maps and Features* Creation & Update with **3DM Feature Extraction & Plugins**



- 3DM Feature Extraction enables effective feature extraction with Mobile mapping data
- 3DM Plugins enable direct consumption of Mobile Mapping Data in end users preferred environment and effective on-demand asset inventory updates

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ORBIT 3DM CONTENT MANAGER

VERSION 20

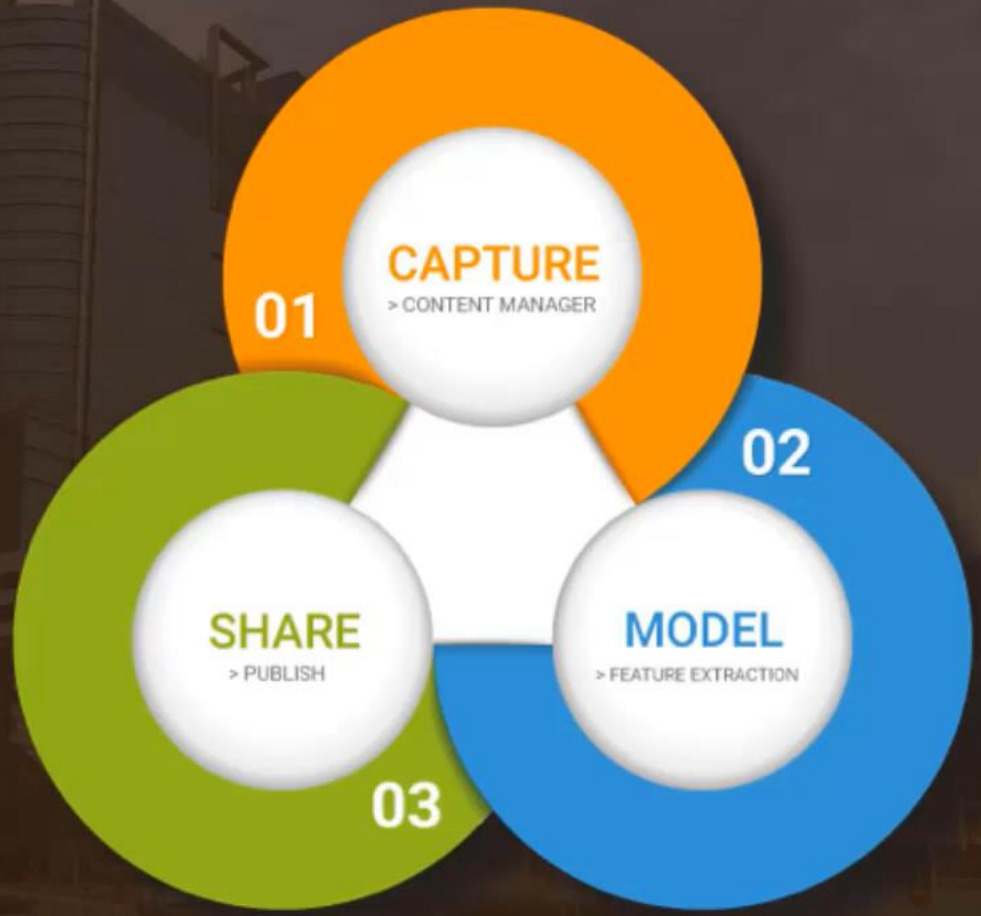
Import - Explore - Verify - Adjust - Deliver

Manage 3D Mapping data after Capture

All vendors & systems supported

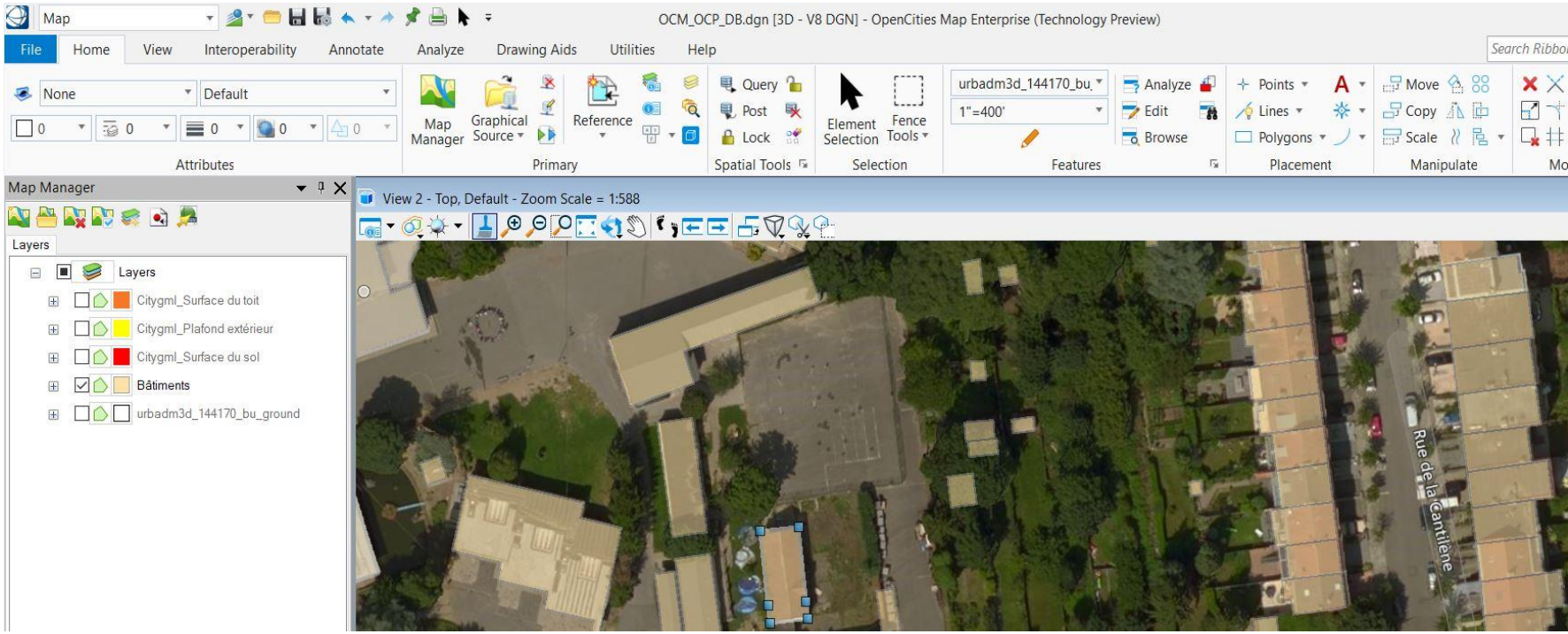
LiDAR USA

orbit


01
CAPTURE
> CONTENT MANAGER
02
MODEL
> FEATURE EXTRACTION
03
SHARE
> PUBLISH

Supporting 4D *Maps and Features* Creation & Update with **OpenCities Map**

OpenCities Map



- Federate Multiple data sources from Reality Data, Engineering (IFC, DWG, DXF…) & GIS (ESRI, SHP, GML..)
- Interactive 3D GIS Feature Editing & Creation powered MicroStation & GIS standard enforcements
- Populate directly Spatial Databases, Run spatial analysis and create delivrables (Maps & GIS files)

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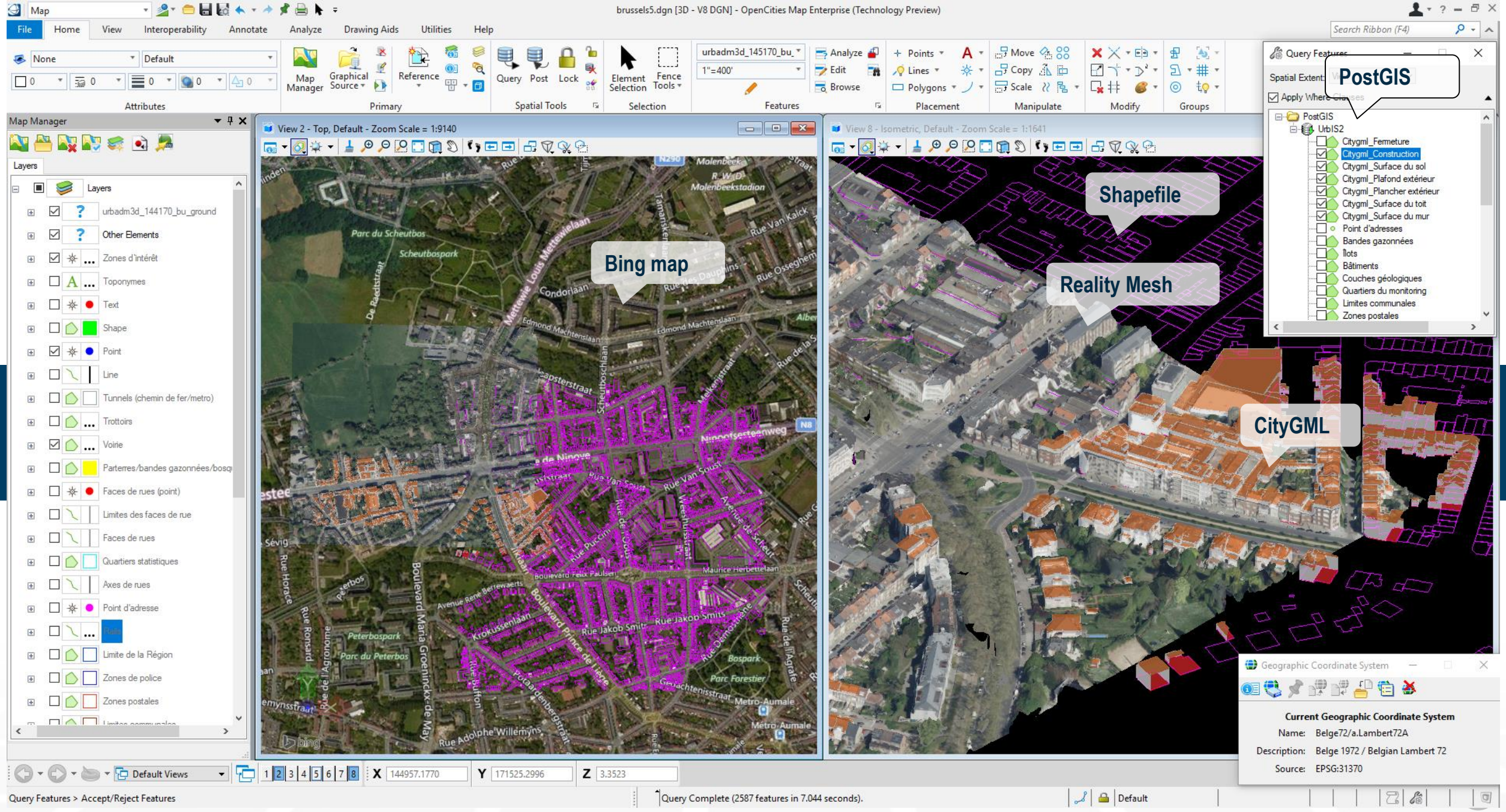

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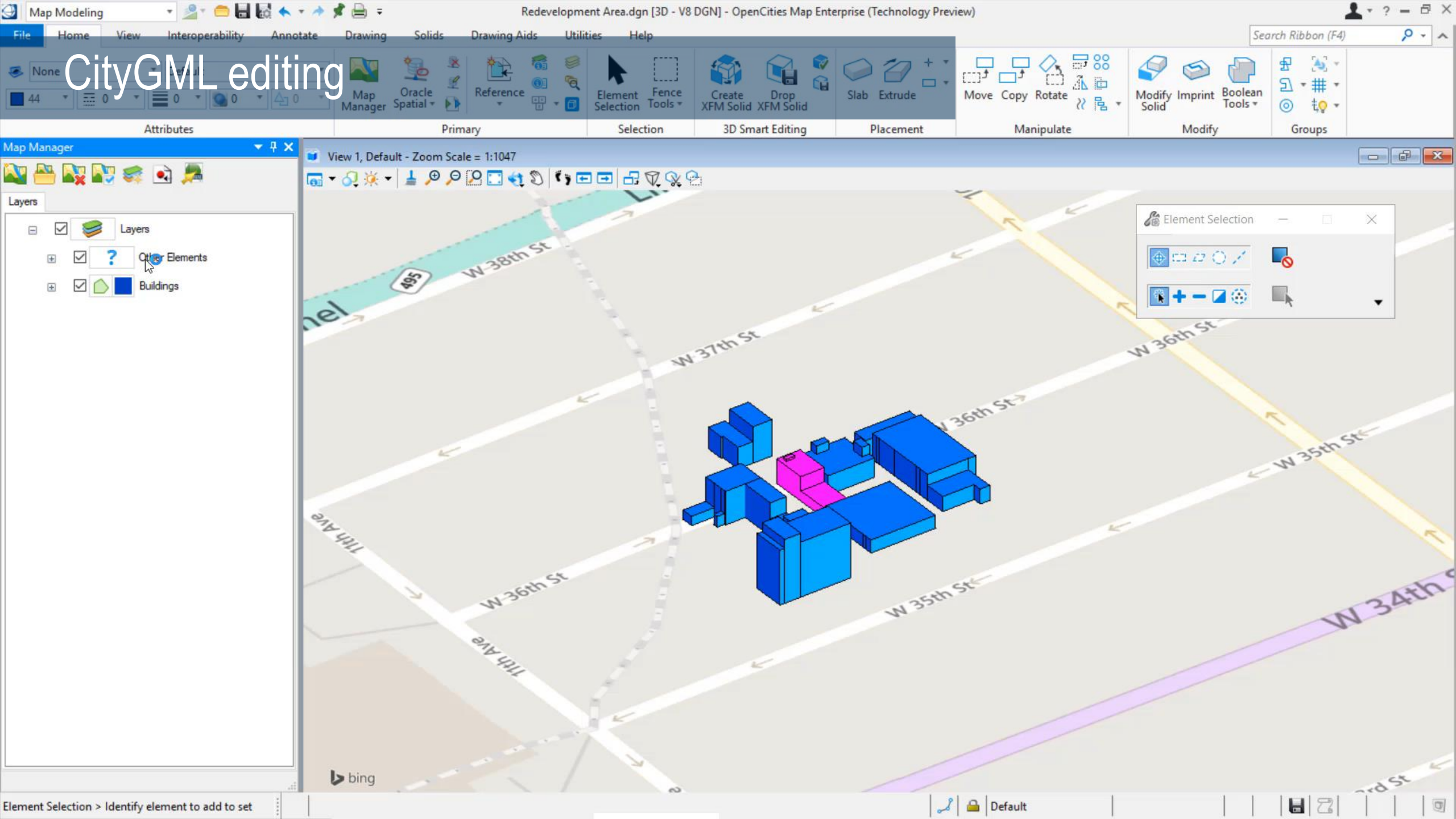
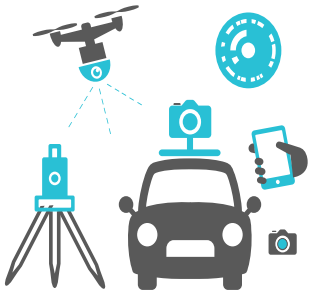
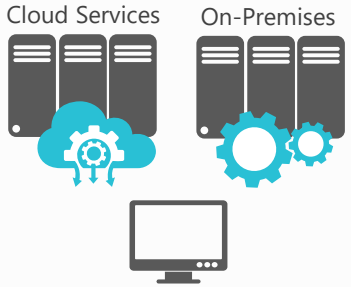
CityGML editing



Reality Modeling, Survey and Mapping Experts



CAPTURE



AUTOMATIC PROCESSING, MANUAL PROCESSING & EDITING

Playbook	
Product	***Solved Problem***
ContextCapture & Insights	Turns Photos &/or Point Clouds into **Reality Meshes** (*on-premise*)
ContextCapture CloudProcessing Service (3CS)	Turns Photos &/or Point Clouds into **Reality Meshes** (*Cloud*)
ContextCapture Mobile	Takes pictures on the field and submit to 3CS to create **Reality Meshes**
PW ContextShare	Store **Reality Meshes ,** Point Cloud and Images on the cloud, manage user access and streams reality meshes
3DM Content Manager	Import, Clean, Catalog , Edit **Point Clouds and Images** & Upload to the cloud
3DM Feature Extraction	Extract **GIS data** (points, lines, Polygons) **from Point Cloud and Images into Spatial DB**
OpenCities Map	Create & update **GIS data & Maps**
Pointools	Edit and Colorize **Point Clouds**

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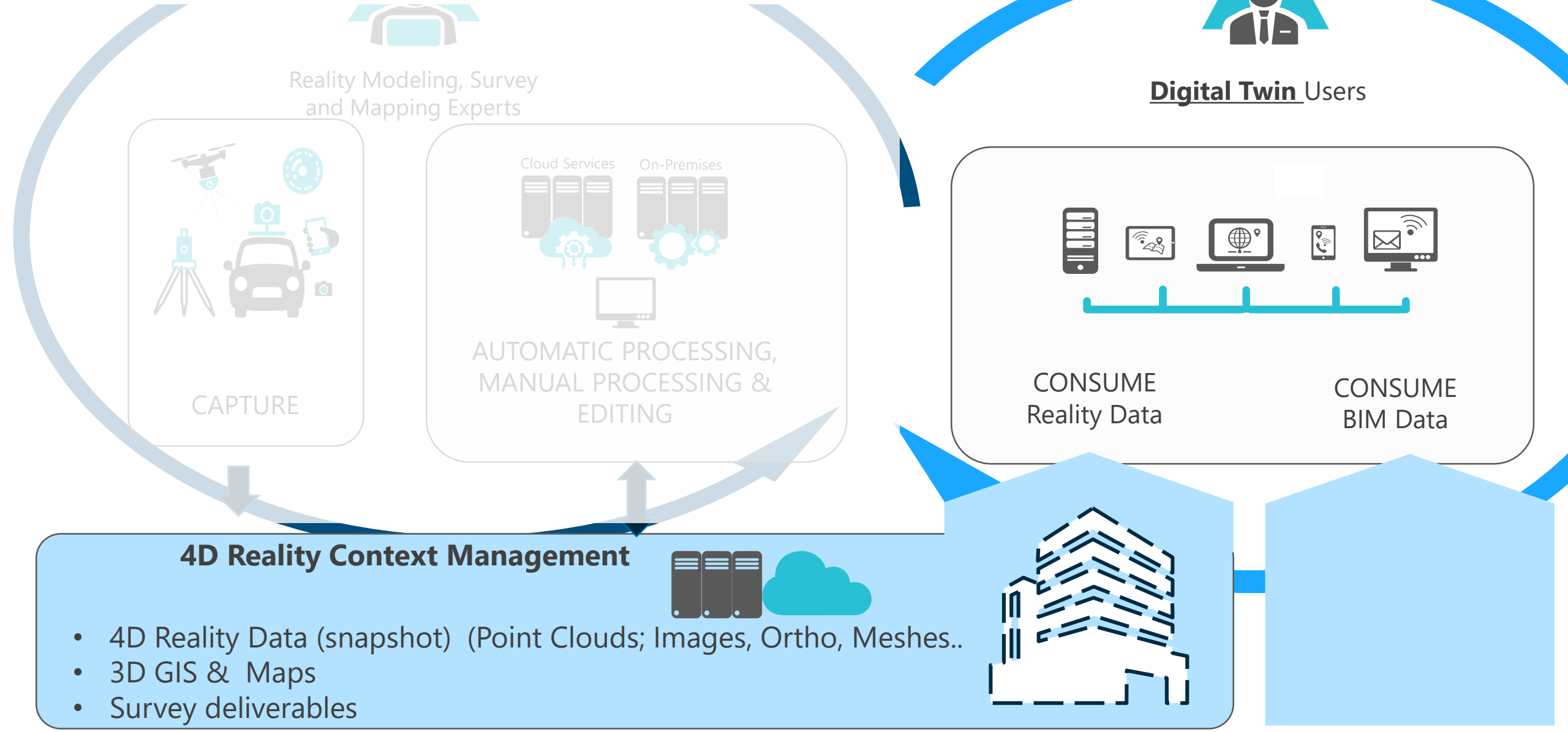
Enabling 4D Context Consumption



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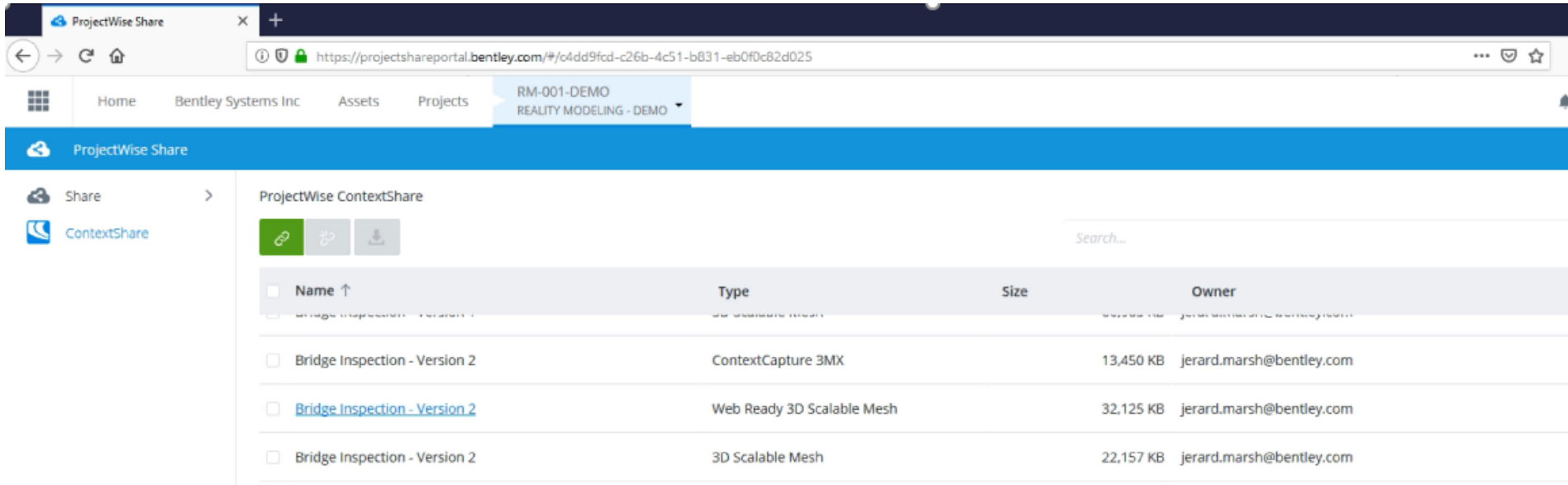
Enabling 4D *Reality Meshes* Consumption: Management with PW ContextShare



- Enables secured management of Reality Data & collaboration between iTwin Users.
- Reality Meshes can be reviewed, measured & annotated on-line
- Reality Meshes can be streamed to MicroStation based applications.

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Add team members for online review

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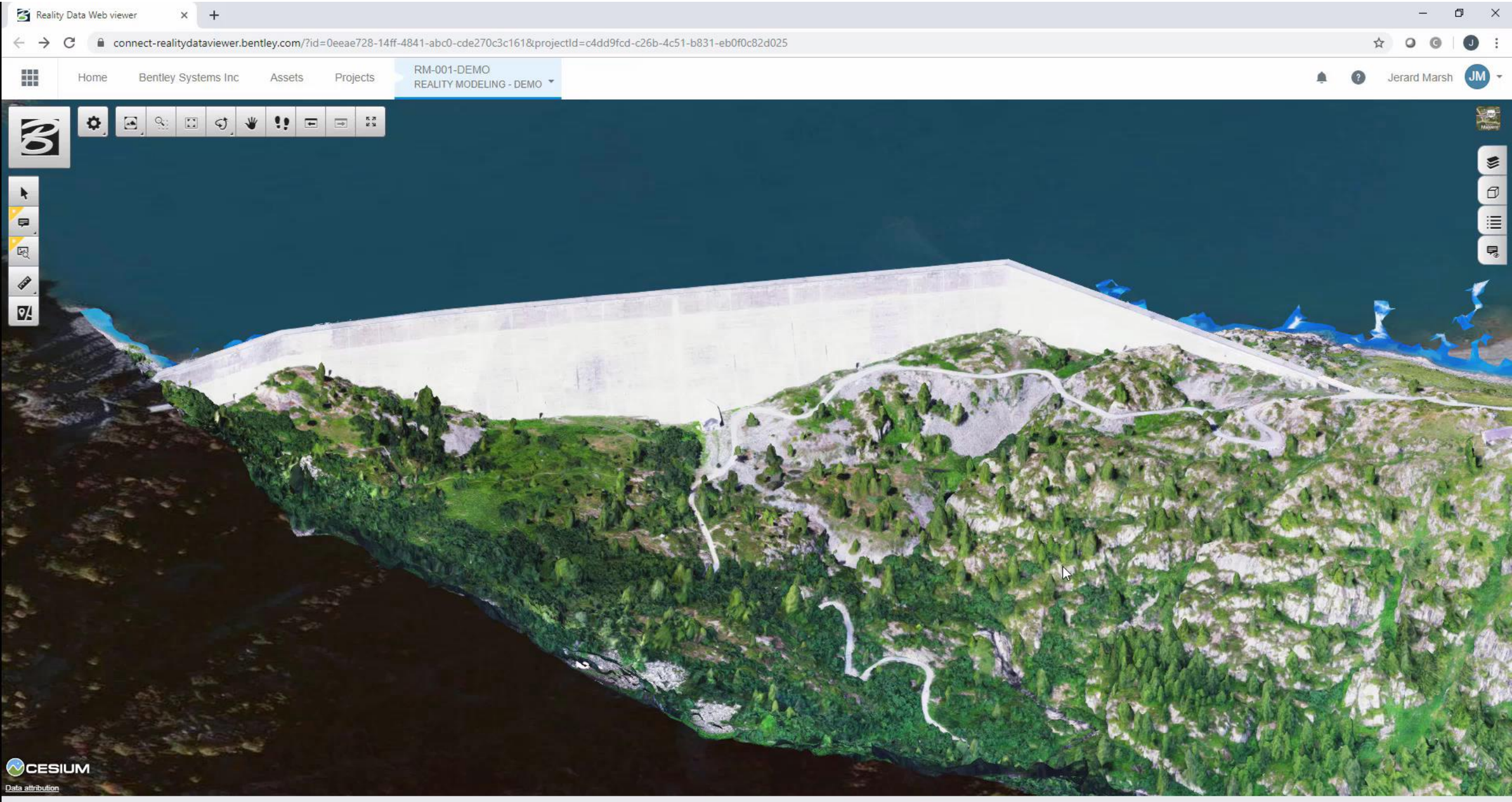
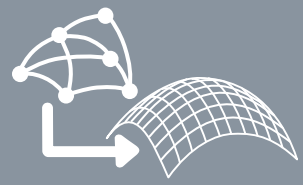

Reality Data Web viewer
connect-realitydataviewer.bentley.com/?id=0eeae728-14ff-4841-abc0-cde270c3c161&projectId=c4dd9fcd-c26b-4c51-b831-eb0f0c82d025
Home
Bentley Systems Inc
Assets
Projects
RM-001-DEMO
REALITY MODELING - DEMO
Jerard Marsh
JM
CESIUM
Data attribution

Inspect and annotate the reality mesh and data



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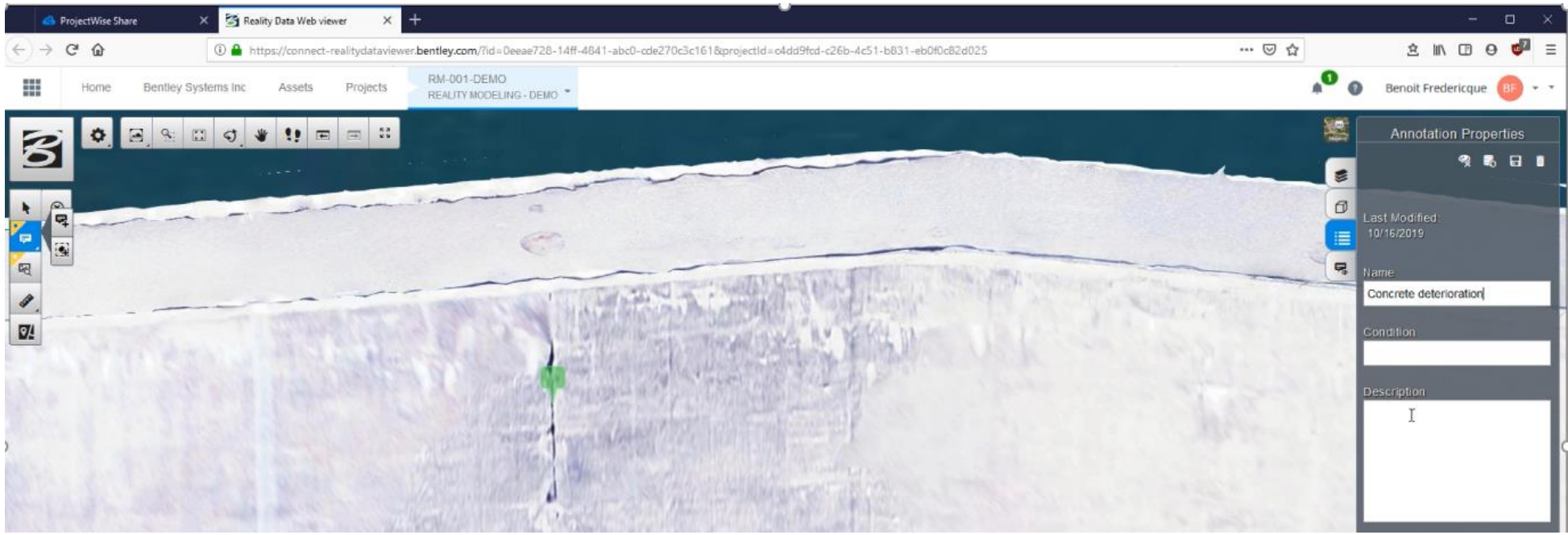
Enabling 4D *Reality Meshes* Consumption: Web review with PW ContextShare



- Reality Meshes can be reviewed, measured & annotated on-line

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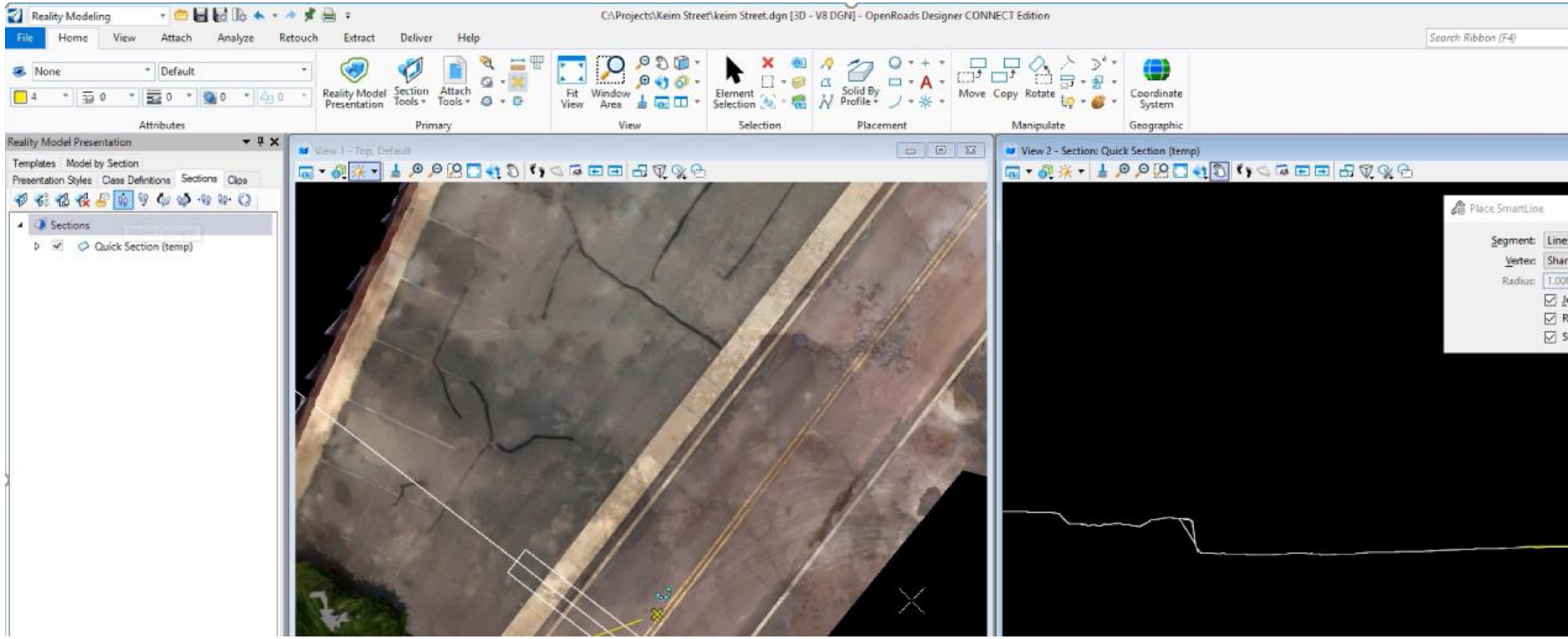
Support inspection workflows with Reality Data Web Viewer

Enabling 4D *Reality Meshes* Consumption: effective handling in Engineering environment



- Display large Reality Meshes directly streamed from PW CS
- Native Element & good citizen
- Advanced dedicated capabilities (Terrain extraction, x-sections…)

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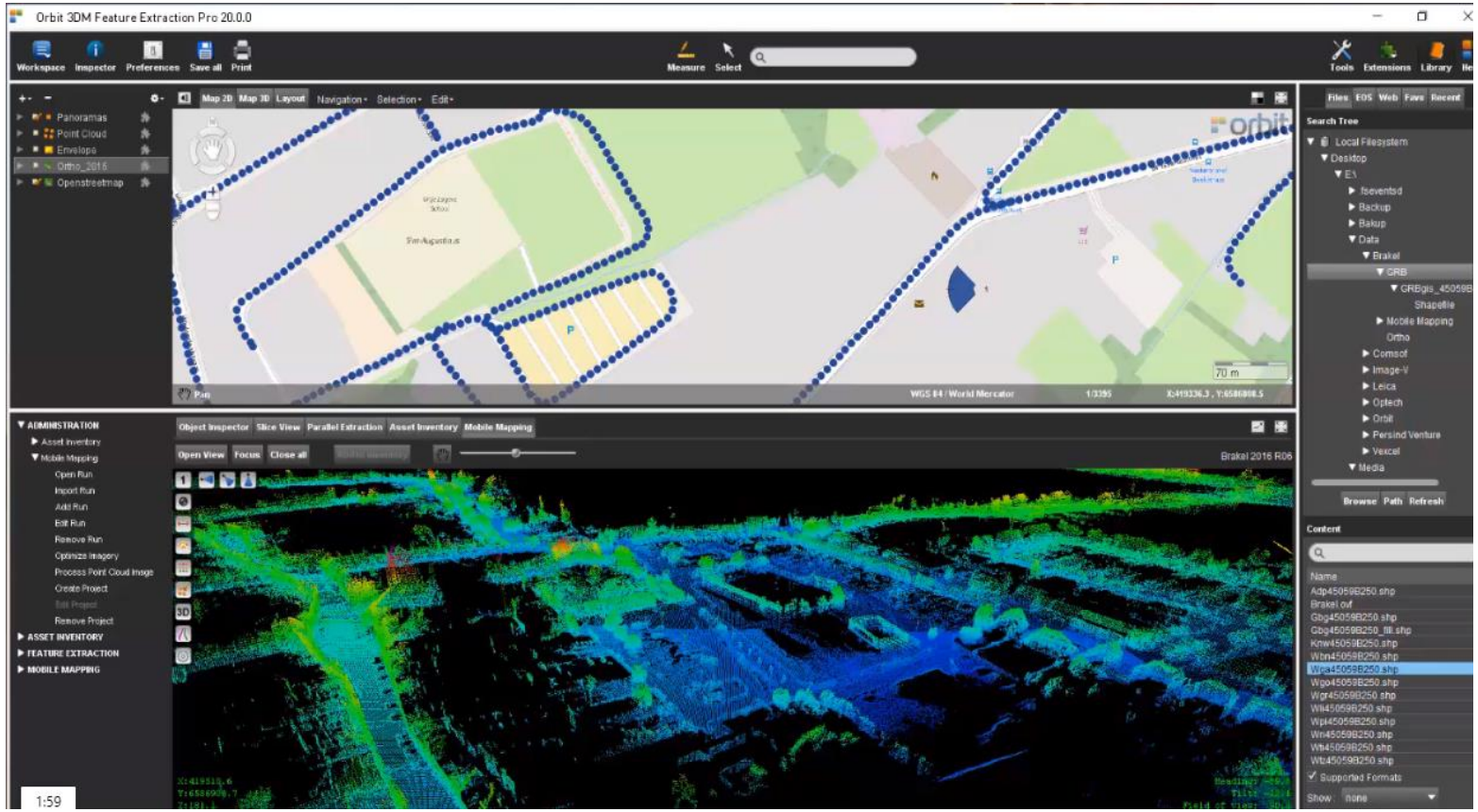
Enabling 4D *Mobile Mapping Data* Consumption: 3DM Feature Extraction Basic



- Simple tools in Desktop product enabling 3D measurments

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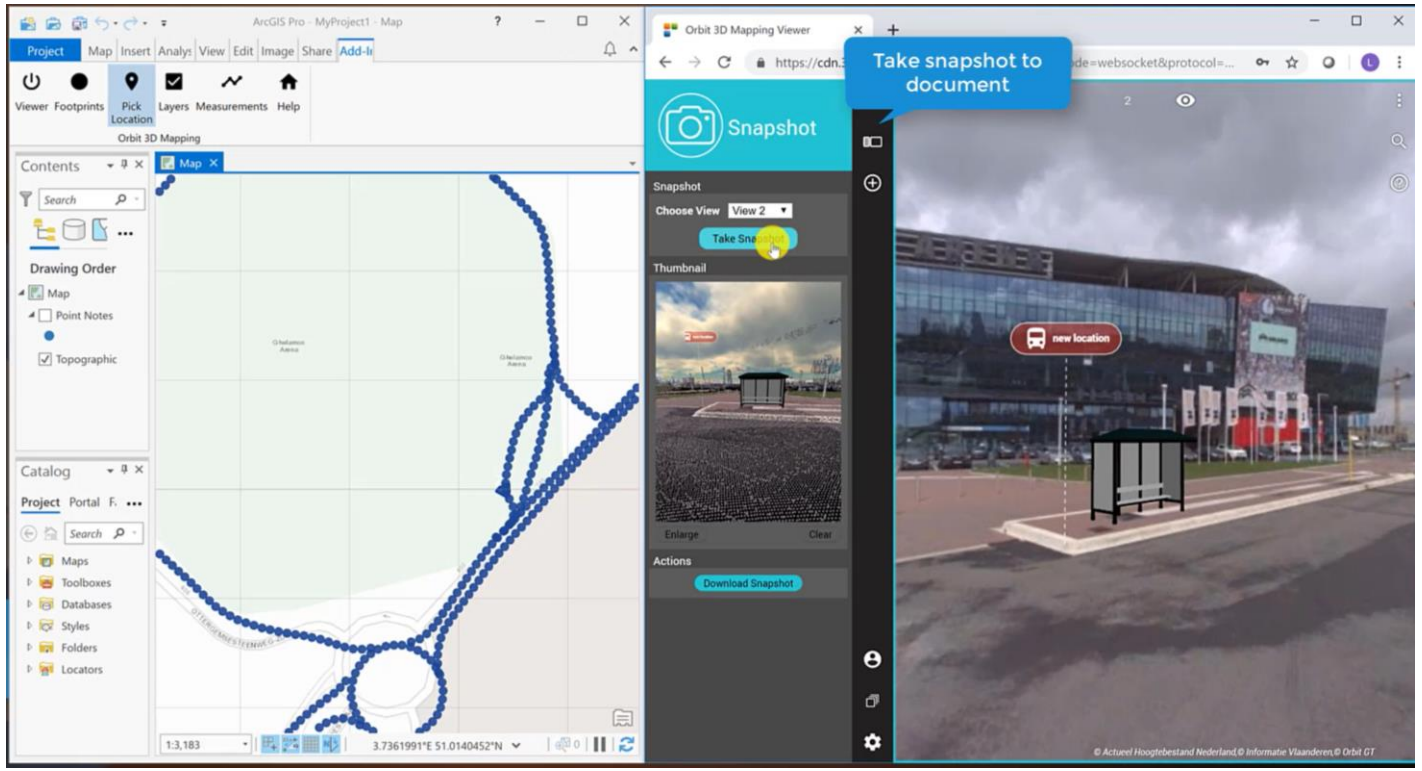
Enabling 4D *Mobile Mapping Data* Consumption: 3DM Cloud & Publisher

orbit



- Plug-ins in numerous end users environment: ESRI, QGIS, Autocad & MicroStation (coming)

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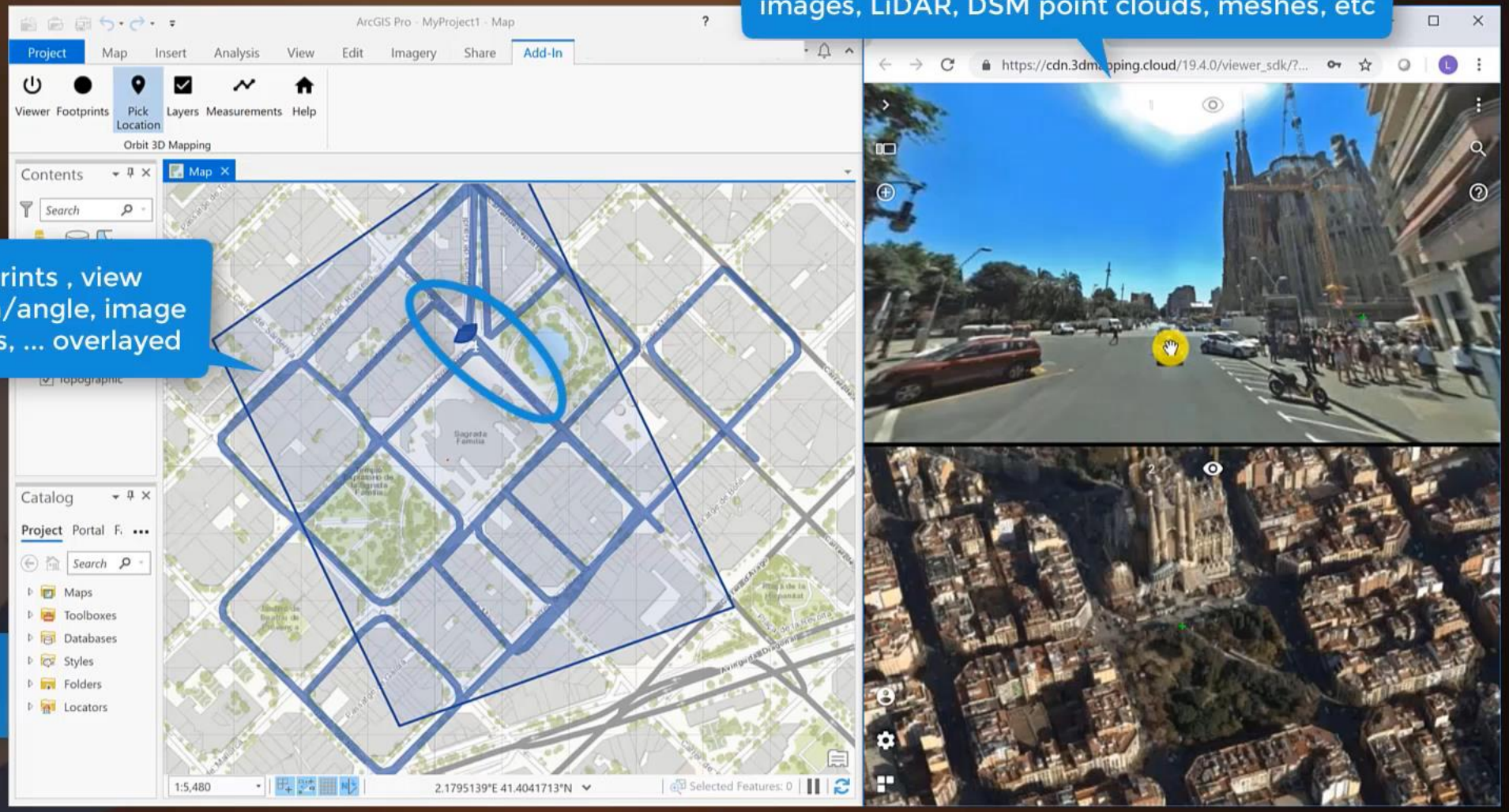
Orbit 3D Mapping Plugin for ArcGIS Pro

Navigate through streetview, nadir, oblique images, LiDAR, DSM point clouds, meshes, etc

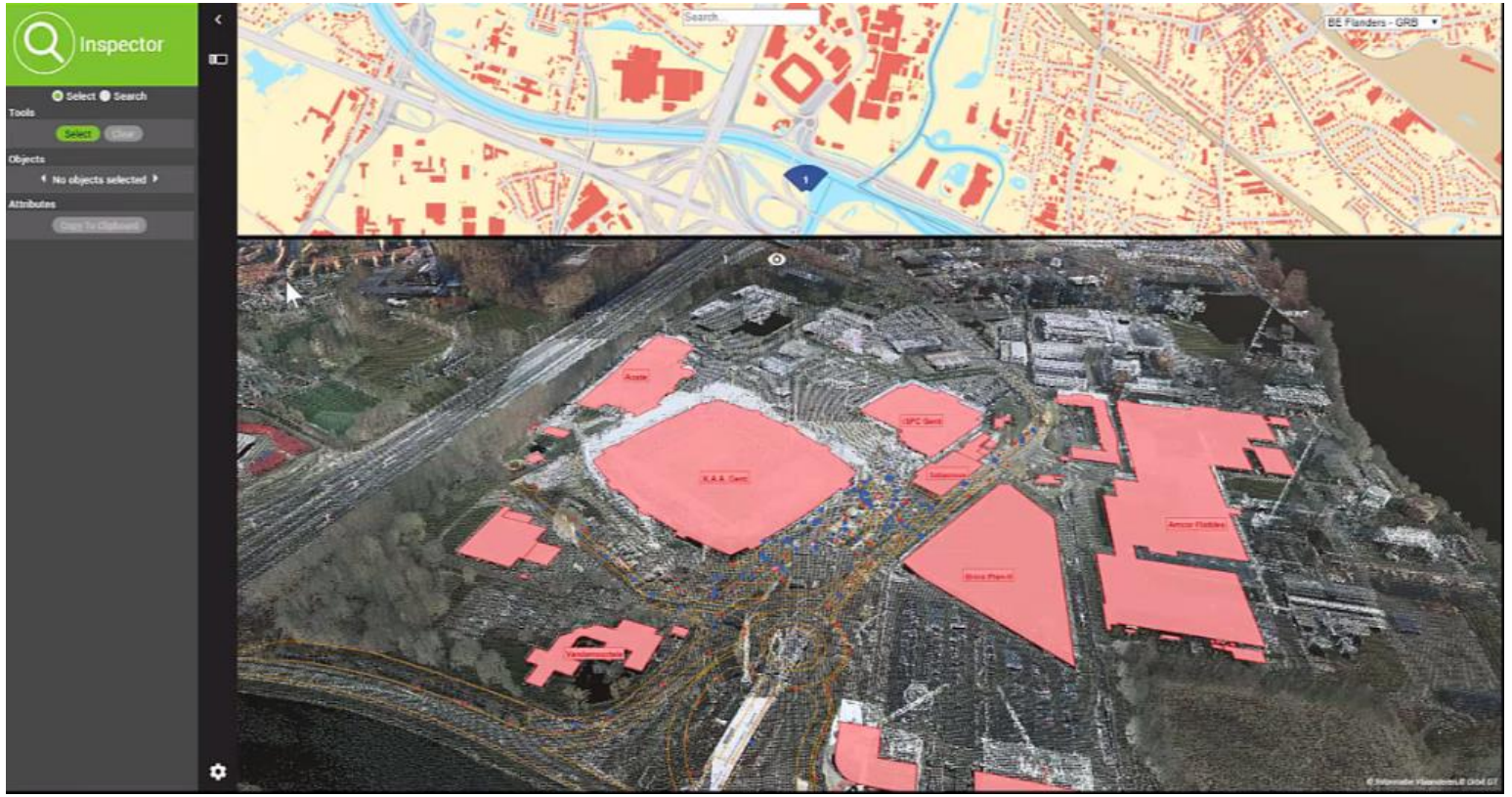
footprints , view direction/angle, image positions, ... overlayed



Navigate

Enabling 4D *Mobile Mapping Data* Consumption: 3DM Cloud & Publisher

orbit



- Customizable web application enable the visualization of Mobile Mapping Data (point cloud & images) with GIS layers

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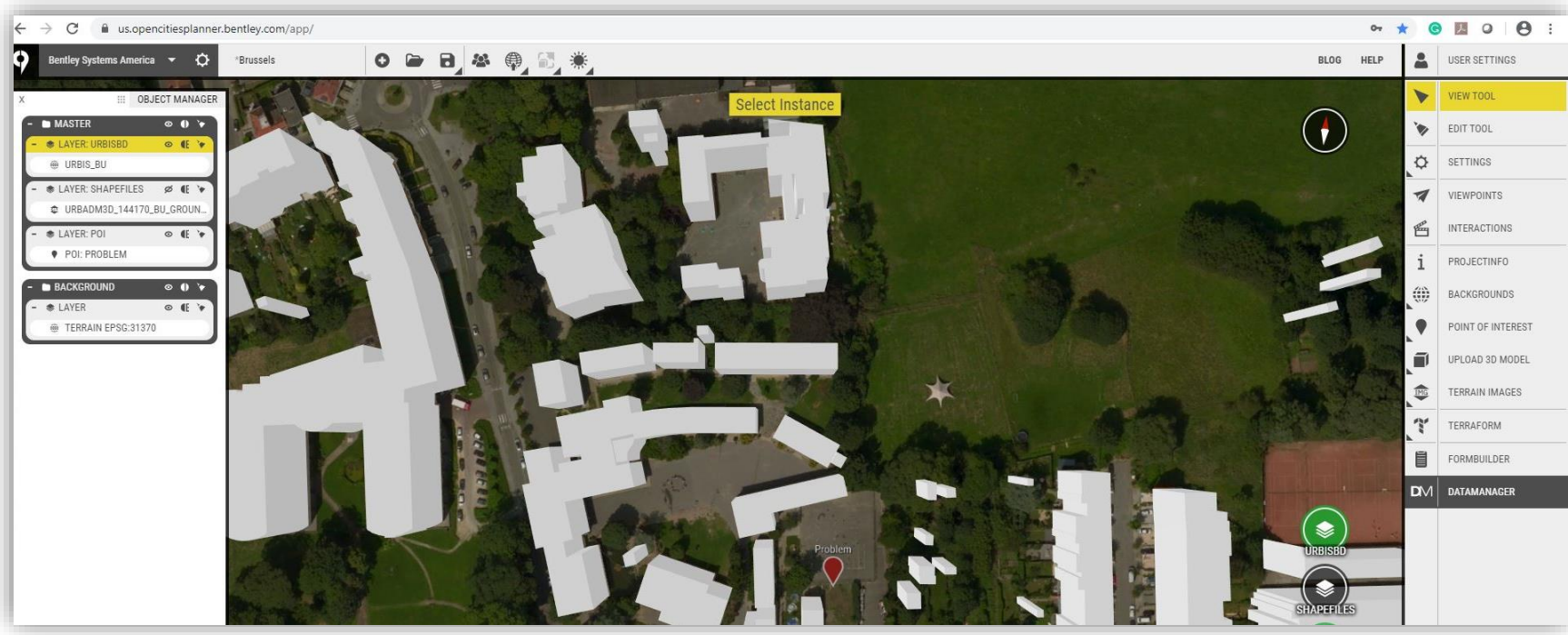
Enabling stakeholders engagement: 4D Context & Projects with OpenCities Planner

OpenCities Planner



- 4D Context (Reality Meshes , Terrain, 3D City Model, Ortho , GIS datas)
- Design (Urban planning & Engineering)
- Simple UX & feedback gathering

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Playbook	
Product	***Solved Problem***
PW ContextShare	Store **Reality Meshes,** Point Cloud and Images on the cloud, manage user access and streams reality meshes. Lightweight review capabilities of **Reality Meshes**
Bentley Design Product (Microstation based)	Visualize **Reality Meshes** streamed from the cloud and local **images and point clouds**
3DM Content Manager	Import/Upload, Catalog , **Point Clouds and Images** to the cloud
3DM Feature Extraction Basic	Enable **Point Clouds and Images** review and simple feature extraction
3DM Publisher	Manage user access, Stores and streams **Point Cloud and Images** (on-premise)
3DM Cloud	Manage user access, Stores and streams **Point Cloud and Images** (Cloud)
3DM Plugins for ESRI, QGIS, Autocad and MicroStation	Enable consumption in side view of **Point Cloud and Images** in Users Environement of hosted data
OpenCities Planner	Large scale & in Context (i.e. with **Terrains, Reality Meshes, Ortho , 3D GIS Data**) Infrastructure project communication through web based visualization & collaboration

Digital Twin Users

CONSUME Reality Data

CONSUME BIM Data

Bentley

Summary

- A unique comprehensive workflow to address *4D Context* Capture, Management and to enable consumption

- Which product do I need?
  - ContextCapture/Reality Modeling **if creating & delivering Reality Meshes**
  - Orbit 3DM if **delivering Point Cloud and Mobile Mapping**
  - OpenCities Planner for **Large Scale Infratructure Project Communication and Collaboration**

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